UNITED STATES DEPARTMENT OF THE INTERIOR, Stewart L. Udall, *Secretary*

FISH AND WILDLIFE SERVICE, Clarence F. Pautzke, *Commissioner*

BUREAU OF COMMERCIAL FISHERIES, Donald L. McKernan, *Director*

BIBLIOGRAPHY ON THE BIOLOGY OF THE COD *Gadus morhua* AND RELATED SPECIES

BY JOHN P. WISE

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Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

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ABSTRACT

A bibliography of 1,020 references on the biology of the cod, *Gadus morhua* L., and related species of North American members of the genus *Gadus* which is reasonably complete through 1959. An extensive subject and geographical area index is included.

BIBLIOGRAPHY ON THE BIOLOGY OF THE COD, *GADUS MORHUA*, AND RELATED SPECIES

By John P. Wise, *Fishery Research Biologist*

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This bibliography was first assembled as an aid to biological studies of cod (*Gadus morhua*) carried on at the Bureau of Commercial Fisheries Biological Laboratory, Woods Hole, Mass. It was planned to include only papers on the cod of the northwestern Atlantic, but it soon became apparent that such a compilation would have limited value. Consequently, the bibliography was expanded to include information on the general biology of cod. Papers on *Gadus* species and closely related forms other than *G. morhua* of the Atlantic were included, but no special search was made for them.

Certain criteria were observed in assembling this bibliography, namely: that, with few exceptions, the material be in permanent printed form; that the subject matter be cod biology; that the publication be available to me for reading and abstracting.

A few papers primarily on technology were included because of information contained on basic biological problems, e.g., the chemical composition of the cod or its bacterial flora. Those interested in the literature on technology per se are referred to the excellent bibliography by McPhail, No. 657.

No evaluation of quality or merit for inclusion in the bibliography was made. Articles in print in scholarly journals, books, and more popular works are included. Annotations are usually limited to cross-referencing as an aid in finding related papers. That the material is not all of equal value is partially reflected in the index, where the most important contributions in various biological areas are indicated.

Much has been published about cod, probably for two reasons. First, the cod is one of the world's most important food fishes and its biology and ecology have been widely studied and reported on. Second, it reaches rather large size, is common, and is fairly easy to maintain in captivity because of its tolerance of widely varying temperature and salinity conditions. As a consequence, it has often been utilized by biologists and experimentalists for studies on a "typical" marine fish. As a result, probably more is known of the anatomy and physiology of the cod than of any other marine fish. In addition, physiologists have worked with captive fish in hatcheries both for purely scientific reasons and to learn more about a particular phase of the biology of the cod for the use of fishery scientists. Since a great deal is known about the general biology of these fish, it is much easier to employ cod in studies of a particular phenomenon than to start blindly with an unknown subject.

The bibliography is incomplete in some respects. Specific weakness will be found in the literature published in the Scandinavian and Russian languages. This is partly the result of the unavailability of material, but more particularly to my unfamiliarity with these languages. Fortunately, contemporary Scandinavian workers often publish in English, and many Russian papers carry an English summary or have been translated in part or in full. The lack of completeness is also partly due to the law of diminishing returns. With the attainment of about a thousand references I find it more and more difficult to find those remaining, and there is little hope that they may all ever be found. At the same time, it is probable that most of the more important works have been found and abstracted.

The citations are largely self-explanatory. The name and initials of each author are given as published. Because of inconsistency in spelling and in completeness of names, the work of the same man may appear under slightly varying names. Unfortunately, differing practices in transliteration also contribute to inconsistency of names.

The language of the title is the language of the publication, with the few exceptions, where the authors have furnished English titles. The name, title, and place of publication of a journal are given as they appear in the issue containing the article. The place of publication is not given if explicit in the title.

Coauthors and junior authors are cited with numbers following, referring to the included publications in which they have a part. It was felt that this would serve a useful purpose in grouping organically related work published under the first coauthor's or senior author's names.

Assistance was given by Elizabeth B. Leonard, librarian of the Bureau of Commercial Fisheries Biological Laboratory, by Deborah L. Harlow and staff at the Marine Biological Laboratory Library, both of Woods Hole, Mass.; by other librarians, by my colleagues who called attention to references found in their reading, and by Harriett E. Murray who carefully checked the citations.

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